A Union Bound On The Error Probability Of Binary Codes Over Block-Fading Channels

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Summary

Block-fading is a popular channel model that approximates the behavior of different wireless communication systems. In this paper, a union bound on the error probability of binary-coded systems over block-fading channels is proposed. The bound is based on uniform interleaving of the coded sequence prior to transmission over the channel. The distribution of error bits over the fading blocks is computed. For a specific distribution pattern, the pairwise error probability is derived. Block-fading channels modeled as Rician and Nakagami distributions are studied. We consider coherent receivers with perfect and imperfect channel side information (SI) as well as noncoherent receivers employing square-law combining. Throughout the paper, imperfect SI is obtained using pilot-aided estimation. A lower bound on the performance of iterative receivers that perform joint decoding and channel estimation is obtained assuming the receiver knows the correct data and uses them as pilots. From this, the tradeoff between channel diversity and channel estimation is investigated and the optimal channel memory is approximated analytically. Furthermore, the optimal energy allocation for pilot signals is found for different channel memory lengths.